# CHAPTER 7

# STORAGE MANAGEMENT TECHNIQUES



## 7-101. General

a. *Management.* In storage and materials handling operations, management encompasses four principal areas of responsibility: people, workload, space and equipment. This chapter treats those essential management techniques which are particularly appropriate to storage and materials handling operations and which experience has proven to be the most effective.

*b. Importance of management.* Managers/directors at major military supply installations are business executives with broad responsibilities. Organization is the structure by which these responsibilities are effected. Management is the planning, organizing, directing, coordinating and controlling mechanism by which the organization is made to function. Thus, there is a continuing cycle in which good managerial techniques are made effective through proper organizational structure as the structure itself produces good managers.

(1) There are certain basic principles that apply to effective organization and leadership. As a manager, basic leadership principles enumerated below, judiciously applied, will result in a beneficial return.

(a) Encourage employees to do a better job by example, and by inspiring them to innovate and suggest improvements.

*(b)* Maintain the "open door" policy so subordinates will feel free to approach you. One good idea from them may revolutionize your operation.

(c) Make no commitments that cannot be kept. Build confidence by becoming known as one who keeps a promise.

*(d)* Nourish the morale of your organization. Believe in your fellow employees.

(e) Instill confidence that your instructions will be complied with, that your suggestions will be heeded, and that your orders will be carried out.

*(f)* Cultivate the art of delegating responsibility. Promote teamwork by developing leadership qualities.

*(g)* Make such things as promotions, citation for meritorious service, retirements, and bonus awards a special event.

*(h)* Recognize that years pass quickly and assure that there is someone capable and trained to carry the major part of the load when the need arises.

*(i)* Encourage all personnel in supervisory positions to have and maintain an updated managers handbook.

(2) These principles, coupled with the application of sound management techniques, will contribute immeasurably to achieving maximum efficiency and economy in storage operations.

c. *The storage and materials handling manager.*

(1) A good manager establishes objectives within the framework of the mission of the organization and operates according to the capabilities of the work force and the facilities placed at their disposal. The manager knows the "how" and "why" of what he/she is asking and is able to evaluate results. Above all, the work force is led to understand his/her directions in order to obtain the desired objectives.

. (2) Complete and common understanding be-

tween the storage and materials handling manager and operators requires the preparation of standard operating procedures, the training of personnel in those procedures and the maintenance of a continuing program to restudy procedures and retrain personnel. The'manager encourages recommendations for improvement in operations and, where indicated, effects revision and refinement of operating procedures.

(3) The successful manager operates with a high degree of flexibility. Through the organizational structure he/she meets sudden and large impacts on' one activity by shifting personnel and equipment from another engaged in tasks of lesser priority, including delegation of authority where practicable. Tasks of lesser priority are maintained as standby projects to be accomplished during periods of nonpeak workload. This balancing of workload, people, and materials, begins with the smallest operation and ends with the total production from the entire activity.

(4) NO matter how powerful a combination of resources the storage and materials handling manager may have, he/she cannot succeed without a team of willing, thinking, and articulate people to guide that combination. The manager has a job to create, develop, and maintain voluntary cooperation and initiative among the people supervised.

*d. Planning.*

(1) Planning is the deliberate consideration of a problem or an operation with a view to determining, in advance, the most effective means of accomplishing a desired result with the least expenditure of manpower, time, and material. Planning involves the determination and visualization of what should be done, where, when, how, why and by whom it should be done, and how long it should take (how many manhours are required, i.e., work standard).

(2) Once a recurring problem or operation has been defined, a procedure or system should be established for handling the situation. Establishment of a system reduces everyday work to routine and the recurring problems or operations can be handled by less experienced personnel. Additionally, personnel at the top echelon are relieved for the more important work of planning for any new or broader problems and for directing, controlling, and coordinating the organization's total effort.

e. *Directing.*

(1) Once a plan has been developed, it then becomes necessary to issue appropriate instructions for implementation. Instructions should be in sufficient detail to assure that the recipient has a clear understanding of what, when, and how the job should be done. On the other hand, except for uniform recurring procedures and methods, which should be reduced to written documents, the instructions should not be in such defined detail that the recipient has nothing left to his judgment. Too much detail can destroy the initiative of the recipient and waste the time of top echelon officials in its preparation;

(2) The potential of the most effective planning or the most productive system in existence can never be reached without motivation of the people involved. To be successful, management must operate with recognition of abilities and unique desires of people. For example, when a person is involved through contribution of ideas and energies to a group goal, the enthusiasm to give his/her best runs deep. To be still more specific, whenever changing to new procedures or techniques, employees meet goals better when those aims take on a personal meaning gained through understanding of the goals and recognition of their ideas.

*f. Coordination. Two* of the more noticeable features of a major military supply installation are specialization and large scale operations. Specialization provides expert attention to related but limited subjects. Specialization also intensifies the need for coordinating the various specialized activities into a composite, well-balanced operation. One of the chief functions of the storage manager is to coordinate activities within his/her area of responsibility, whether that area be the installation as a whole or an organizational element of the installation.

g. *control.*

(1) A plan having been developed, its execution directed and coordinated, a last and very important step is to determine the status of the resulting operation during its various stages of accomplishment. Proper controls permit timely corrective action if the operation is not being effectively executed or proves to be defective. Control founded on comprehensive and accurate information takes the guesswork out of management and forms a sound basis for decisions and planning. However, reports and charts do not in themselves provide solutions to management problems. They merely serve to highlight areas of deficiency which must

then be subjected to further planning, direction, and coordination.

(2) The use of automatic data processing (ADP) equipment and techniques to their maximum potential usefulness must be exploited. The astute manager will be constantly aware of the possible improvements to the organization as a result of the modern management techniques made possible by computers.

(a) Daily progress or status registers are easily. maintained by computer program. Voluminous printouts, however; are to be avoided. The manager must be ever mindful of the cost of preparation and distribution of ADP reports, hence, reports should be keyed to the exceptional items or out of tolerance conditions which warrant immediate attention. Ideas for new or improved reporting techniques, as well as elimination of those reports which are no longer useful, contribute to a higher overall effectiveness and therefore are actively solicited.

(*b*) Toward this end, consideration should be given to the installation of peripheral input/output devices in the executive office(s). Several of the newer high speed terminals such as the cathode ray tubes or thermal printers are fast and totally silent, thereby lending themselves to the office environment. In this way, required information is available in the form of graphics or text for display on a real-time basis, at a touch of the finger.

(3) Those installations which do not have extensive central computer facilities should consider the availability of timeshared terminals. Many commercial terminals are available on a rental basis with installation as simple as replacing an office typewriter. The only additional requirement is the availability of a standard telephone to accomplish the computer to terminal link.

(4) While most of the storage applications program will require special purpose software, there exists an extensive variety of "canned" programs available in the industry at minimal or no cost to the Government. Frequently these simulation-type models can be employed in the decision making processes where heretofore only best guesses were possible.

(5) One area in the field of ADP storage where substantial savings are possible, and therefore of obvious concern to the storage manager, is the generation of source data. Older methods of handscribing with subsequent keypunch card generation are giving way to original preparation of information in a machine-readable form. At the present time, mark-sense cards offer the best known approach, but optical character readers are playing an ever increasing role in source data automation.

(6) The use of standard terms, symbols, documents, etc., will provide a level of uniformit y and compatibility and permit operation of systems designed at one activity to function at multiple locations. All information requirements, internal and external, should be derived from common use data to the maximum extent feasible.

### 7-102. Manpower and Equipment

*a. Manpower*. Manpower is one of the primary resources of a supply installation. It is also the greatest item of expense. As such, it must be properly utilized, assigned, and directed. Economical and proper personnel/labor assignment depends on thorough planning during consideration of scheduled assignments. General personnel labor problems should be openly discussed among staff members and heads of component units of the activity. By this means every individual performing management duties will be fully informed of the overall labor situation and made cognizant of his own responsibilities toward the efficient employment of the forces assigned to his charge.

*b. Labor and equipment pools.*

**(1)** This section not applicable to ammunition operations.

(2) *Labor*. Operational requirements in warehouses or other component elements of depots and other major supply installations can and do vary extensively from day to day. In view of this, the assignment of laborers and equipment to subdivisions of such activities on a permanent basis can become an uneconomical practice. Consistent with mission and organization of the activity, it is more economical to permanently assign to a unit that amount of laborers and equipment needed to perform no more than 75 percent of the average work load. All other labor and equipment can be assigned to a Central Labor and Equipment Pool from which they may be dispatched, as required, to those components of the storage activity confronted with peak or heavy work requirements exceeding the capabilities of the permanently assigned minimum work force.

*(a)* The pooling and assignment of manpower and equipment according to priority workload,

proves successful only when such assignment is conducted on an absolutely impartial basis. Personnel and equipment pools must be operated for the benefit of all elements concerned, based purely on needs generated by work load or the purpose of the Labor and Equipment Pool will be defeated. For this reason, organizational placement of the Labor and Equipment Pool should be given careful consideration. This can best be accomplished when such assignments are directed by a Production Planning and Control activity. This will assure maximum Utilization of facilities and manpower by the application' of work measurement standards (where feasible) in the planning, scheduling, and control of workload and manpower distribution.

(b) Notwithstanding the overall management and distribution" of men and equipment based on work standards, instances often arise in actual floor situations where the workload increases in several areas of an activity simultaneously and the combined labor requirement exceeds the capabilities of the forces available. When this occurs, a decision as to equitable use of available pooled resources should be made by the chief of each activity involved, with prime consideration given to the higher priority workloads. When this management effort is not sufficient to cope with the volume of priority workload in a given operation or function, the decision on realignment of priorities should move up the echelons of management/command to the necessary level.

(c) Separately trained elements may be developed in the pool so long as flexibility is not impaired. Personnel and squads should be assigned to like jobs whenever possible; that is, warehousing, shipping, receiving, etc. Overspecialization should be avoided since it defeats the purpose of a labor pool.

(d) Effective management of pooled resources requires constant consideration of the time factor involved in any movement of labor and equip ment from one assignment to another. Assignments/reassignments should be closely studied before being placed into effect otherwise an excessive amount of the working day can be lost in traveling from one work site to another.

(e) The ideal situation exists when the workload is sufficiently large to permit the assignment of a squad or crew to a given job or area for an entire working day. In instances where this is not possible, and transfer from one area or warehouse to another throughout the day becomes necessary, good management and planning will assure labor . . . . . assignments to jobs which are located in proximity to each other.

(3) *Equipment.*

*(a)* Equipment dispatched from the Labor and Equipment Pool should be in balance with the assignment of labor. Materials handling equipment on hand should be categorized (i.e. powered, nonpowered, age, size, capabilities, and capacity). Managing the use of equipment to achieve maximum economy in its utilization should be a prime management objective.

*(b)* Where it is practicable, operators of motorized equipment operating from pools should be assigned permanently to a given vehicle.

## 7-103. Production

**a.** ***Criteria.*** Productivity of an operation is contingent upon the establishment of a standard performance. Achievement of maximum productivity comes about through informed workers, practical production standards, use of standard methods, and by reducing as many operations as practicable to routine tasks.

*b.* ***Production*** *records.* Records of production are beneficial as management tools in that they provide a means of planning and distributing resources. Depending upon the echelon of management, the production unit(s) selected should be broad units (e.g., mixed trucks received) which most typifies the work to be accomplished. A production record should consist of substantially the following types of information.

**(1) The** number of production units on hand at the beginning of the report period (day, week, etc.).

(2) The number of production units received during the period.

(3) The number of production units processed and the average processing time per unit. Average processing time may be determined from a frequency analysis of the occurrence of the various elements of the operation and their time standards.

(4) The number of manhours required to accomplish this work.

c. ***Analysis.*** To determine the efficiency of current operations, production records should be analyzed periodically. The frequency and depth of such analysis will depend upon the degree of management impact at the various echelons of review. Analysis should answer such questions a.s-

(1) Where do backlogs or bottlenecks exist?

(2) Where is the workload light or heavy in terms of assigned personnel?

(3) What organizational element(s) are failing to meet production standards?

(4) When did the element(s) start to fall behind schedule; were required management actions taken to correct the situation?

d. Cause *of deficiencyes*. Disclosure of the existence of deficiencies enables the manager/supervisor to find the cause. These-may be traceable to—

(1) Poor or *adequate supervision.

(2) Low morale.

(3) New and inexperienced labor, or poorly trained labor.

(4) Breakdown of tools or equipment, or inadequate or poorly utilized tools and equipment.

(5) Careless or poorly organized work methods.

(6) Excessive absenteeism.

(7) Personnel not assigned to units in proportion to work load.

## 7-104. Use of Charts

*a. Charts* to record daily cumulative performance data are excellent management tools for improving operations. Such charts reflect trends and establish a factual basis for needed indepth evaluation of operating efficiency and productivity. They also provide an opportunity to identify and correct weaknesses before they assume dangerous or serious proportions.

*b*. Suggested examples for development and maintenance of charts reflecting such performance data as receiving and shipping records are shown in figures 7-1A and 7–1B.

c. Examples for charts reflecting tons of material handled and units inspected are shown in figures 7-2A and 7–2B.

*d*. A continuing chart record of receiving and shipping performance would show as a minimum.

(1) Productivity to date as better or worse and its plus or minus relationship to the record of the previous day or week.

(2) Current productivity comparison with that of the previous month or year. ”

e. Charts may be kept on a daily, weekly, or monthly basis according to type data presented.

*f*. In preparing charts, the first step is identification and insertion of the acceptable performance standard.

g. Next apply horizontal lines above and below the identified standard. As shown in figures 7-1A and 7–1B one line is drawn at 20 percent above the’” standard and.. another drawn 20 percent below standard.

*Note.* The 20 percent line above and **below standard is for illustration purposes and is not intended to mean that the 20 per cent tolerance range is accepted practice.**

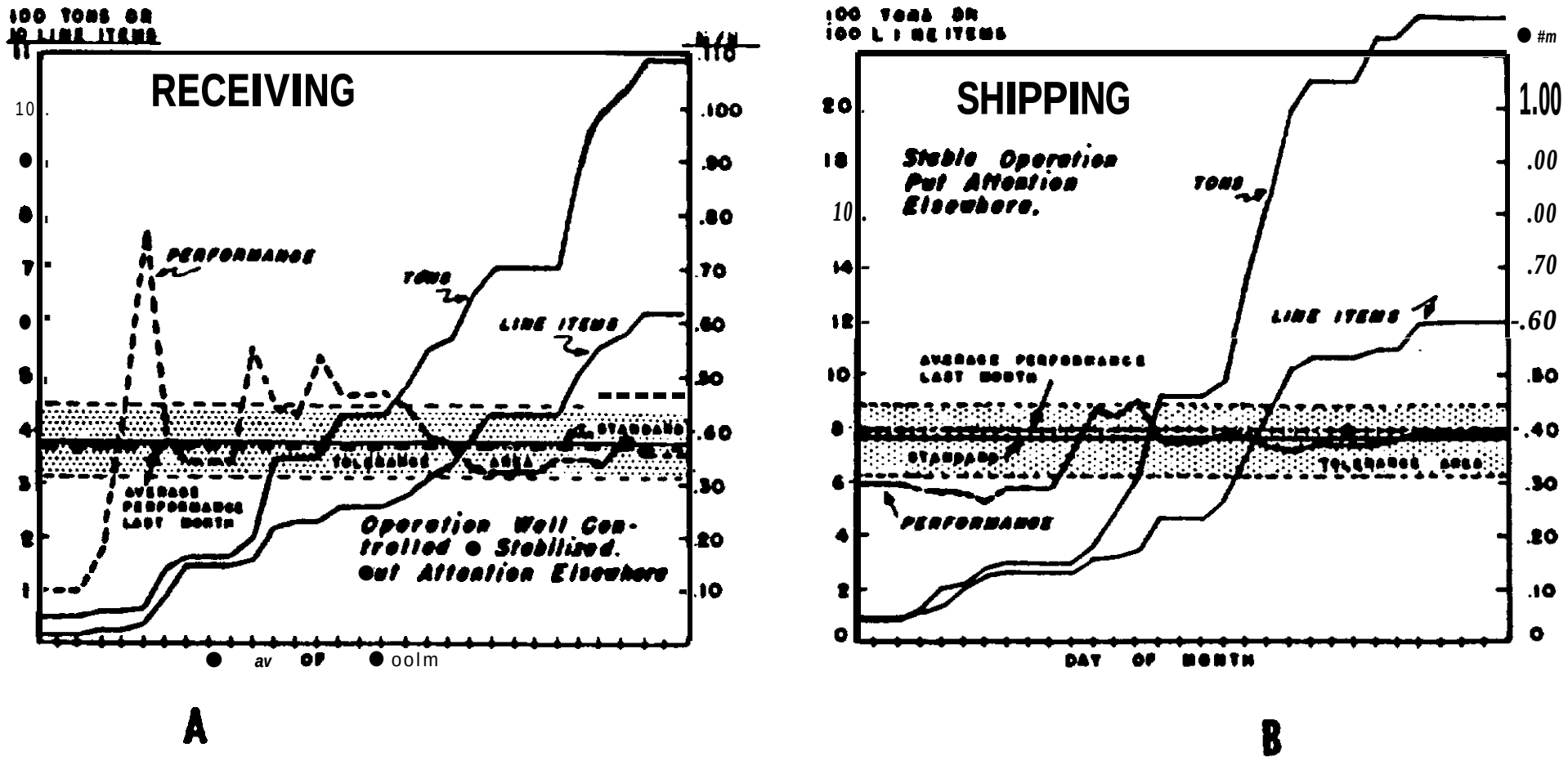


*Figure 7–1. This type chart shows where you have been, where you are and where you are heading.*

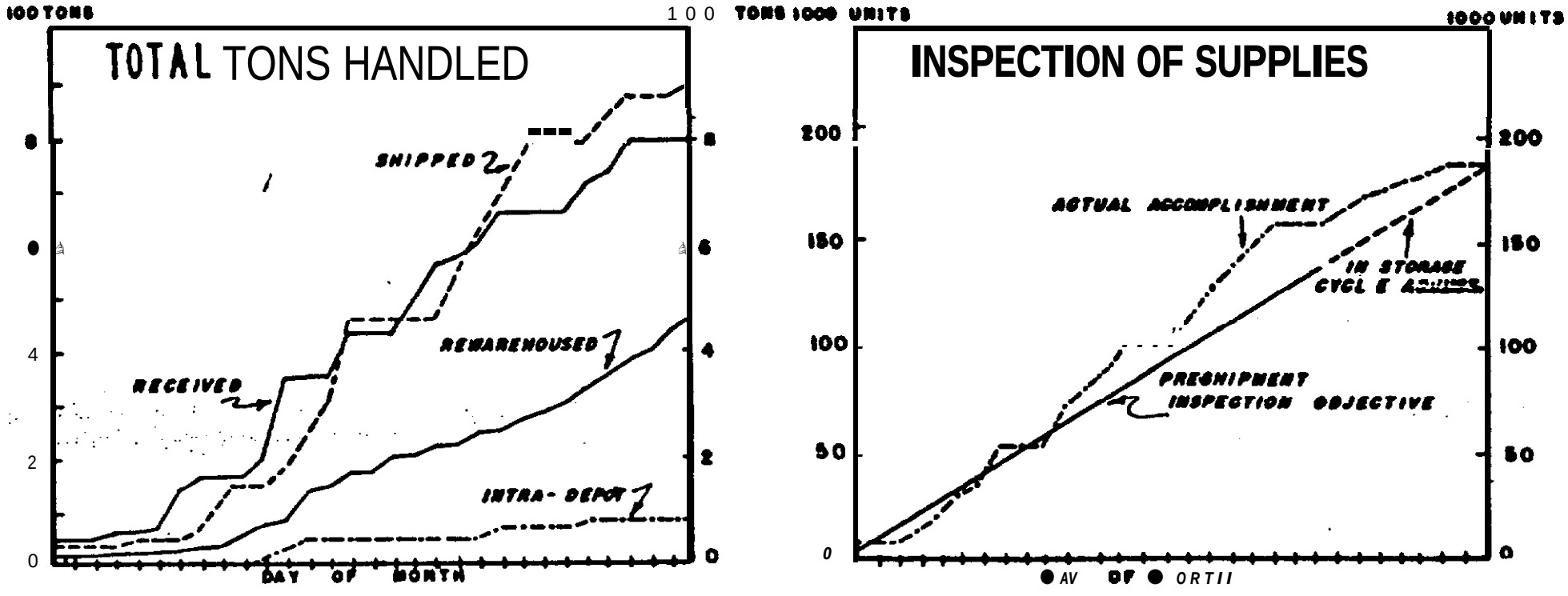


*Figure* ?-2. *Charts can take different forms.*

**These two lines provide for a "tolerance area" within which performance will be considered "satisfactory." The next step is to insert the average performance achieved during the previous month.**

*h.* An activity is rarely able to judge its progress overall by how many units are processed on a given day but rather by how many units were processed through a given date in a period of time. An acceptable means of accomplishing this is if, beginning with the first day of the month, the performance units per production manhour are inserted for that day. On the second day, the first and second day's performance is added. Average the two and insert the figure, and so on.

*i.* Charts should be large enough to be easily read and placed in a conspicuous location to command attention of personnel employed in the activity.

*j.* Payload tonnage (fig. 7-2A) handled by an activity is normally the sum of tons received and tons shipped. A rise in handling intra-installation tonnage or a continual and significant increase in intra-installation tonnage bears investigation because a number of deficiencies may be entering the operation. Some of these maybe cross-hauling that could be reduced or eliminated, the use of inefficient or improper vehicular equipment, or lack of proper planning or supervision. Generally speaking, the less the intra-installation material movement and handling and the more the tonnage handled in and out, the healthier the situation.

*k.* Figure 7-2B shows . .e material inspection (quality control) objective(s) for a given period. In the example, the number of units anticipated for preshipment inspection is shown together with an estimate of in-storage or in-process inspections planned or scheduled which, in the main, would have negated the need for preshipment inspection. The dotted line shows how close to attainment of the objective was the accomplishment.

## 7-105. Analysis of Methods

*a. Analysis to precede equipment selection.* Materials handling equipment and tools should not be selected or requisitioned for an operation until after a thorough analysis has been made of the materials to be handled, the conditions and environment in which the work will be performed, and the method to be employed.

*b. Operation lists.* In any handling problem there will be several specific operations which must be performed. Listing these operations, in the sequence performed, may be sufficient to indicate the method to be employed and, in any case, should serve as a valuable guide and check to more detailed analyses which may be made at a later date.

c. *Work simplification. The* purpose of work simplification is to eliminate unnecessary work elements and develop or find simpler methods of accomplishing necessary work. This can be accomplished by questioning each step in the process (what and where, when and how, why and who),

changing the sequence of operations as necessary, combining some operations, or eliminating some job elements.

d. *Motion study*. Motion study refers to the study of the motions made by the worker in performing assigned tasks. This study may be merely visual observation of the worker. Important things to observe include the distance the operator reaches for his tools and supplies, the number of steps he takes, the repetition of tasks, and the smoothness of the motion pattern. Often, merely by listing the specific tasks carried out by a worker in connection with the performance of an operation, unnecessary steps and excessive movements can be eliminated.

e. *Flow chart diagram*. The flow chart and the flow diagram are used for the study of material flow from one work area to another. A completed chart or diagram graphically depicts an operation. Included in the chart are distances, physical conditions affecting the operation, and the number of times procedures and tasks are-repeated.

*f. Methods study/work standards*. This is a systematic analysis of an operation utilizing industrial engineering techniques to determine the optimum method or procedure to accomplish an operation and the time it should take. The operation must be segmented by the analyst into elements appropriate for timing. This is not to be construed as physical revision to the production process unless this is an obvious and necessary recourse. The actual timing of each performance is relatively simple. Assuring that the time reflects normal operations under normal conditions is more difficult and requires an estimate of the pace of a worker by a skilled analyst or technician. Time standards are valid as long as changes are not made in the operation, system, method, condition or type of operating equipment or the number of personnel assigned to perform the work. Time standards include a time allowance for personnel needs, normal worker fatigue, and avoidable delays of short duration. Changes made to work under time standards should be the result of methods analysis, change in product, equipment work content, or economic factors. Time standards provide a valuable tool for planning and controlling work, as a means for measuring the efficiency of operations, and for determining the amount of manpower resources required.

7-106. **Use of Incentive Awards Program**

*a*. The awarding of cash and/or commendations for new and acceptable suggestions has become one of management's most important tools. The use of an Incentive Awards Program has two basic advantages, one of which is that it encourages new ideas. Experience has shown that top level management has no monopoly on originality. New ideas can flow up as well as down, and very often do. The individual actually performing a warehouse operation is perhaps in the best position to recognize the need or desirability for a change in procedure and to develop scientific methods for its improvement.

*b*. The other advantage of this program is that it stimulates interest and encourages employee participation in management. It 'serves as a means of according due recognition to suggesters. By inviting the attention of supervisors to those employees who are striving to improve the efficiency of their organization, it is a morale builder of major importance.

**7–107.** Onsite **Reviews and Checks**

*a. General.*

(1) Periodic onsite reviews are another indispensable tool of management. By this means managers can determine the extent to which instructions, regulations, and operational procedures are being carried out.

(2) The manager should make a daily review of at least one phase or segment of the operation. These reviews should be planned on a cycle basis so that at the end of a specific period they will have covered all phases of the operations. In turn, key and line supervisors should also make frequent checks of their particular activity.

(3) Reviews made by management personnel should include all administrative and operational functions bearing directly or indirectly on operations. More specifically, they should include the following

*(a)* Application of established operational policies, procedures, and instructions.

*(b)* Application of the most economical administrative and technical methods for the utilization of personnel, equipment, and storage space.

(c) Suitability of space, materials handling equipment, and operational methods, as applied to a specific facility and the type of material stored or handled therein.

(d) Training of personnel.

(e) Information with respect to methods and procedures which do not conform to agency regulations.

(f) Labor difficulties being experienced either within the operation or from outside sources.

(g) Excessive operational costs pertaining to personnel, space, equipment and storage,

(h) Inaccurate, superfluous, or insufficient documentation for required recording and accomplishment of operations.

*b. Supervisory checks.* Checks made by supervisors should normally be more frequent and more detailed than those made by the manager. To ensure that any deficiencies on reviews are speedily corrected, appropriate followup action must always be taken.